Cross section standards for neutron-induced gamma-ray production in the MeV energy range

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Several neutron-induced gamma-ray production cross sections have been suggested as "secondary" standards. Fe(n,n_1'γ) producing the 847-keV gamma ray from the first excited state of ^{56}Fe, Cr(n,n_1'γ) 1434 keV, Al(n,n'γ) 3004 keV, and Si(n,n'γ) 1779 keV, have all been considered as possible standards for neutrons in the MeV energy range. However in two recent evaluations [1, 2] the E_n=14.5-MeV cross section for Fe(n,n'γ) differs by about 25%, even though both evaluations report accuracies of +/- 5 to 10%. While there are many more measurements on Fe than on Cr, the data sets for Cr show better agreement than is the case for Fe. We discuss some of the complications in measuring these cross sections accurately, and present recent work using the GEANIE high-resolution Ge detector array at the LANSCE/WNR broad-spectrum neutron source to make both absolute and relative measurements on Fe, Cr, V, Si and Al in the energy range from 1 MeV to over 50 MeV. Results and recommendations will be presented.

[1] S. P. Simakov, A. Pavlik, H. Vonach, and S. Hlavac, "Status of Experimental and Evaluated Discrete γ-Ray Production at E_n=14.5 MeV", INDC (CCP)-413 (1998).
[2] M. V. Savin, A. V. Livke and A. G. Zvenigorodskij, "Evaluation of Angular Distributions and Production Cross-Sections for Discrete Gamma Lines in Iron", INDC (CCP) 426 p. 95 (2000) translated from Yadernye Konstanty 2 (1999). Available at the WorldWideWeb site: http://iaeand.iaea.or.at/reports/INDC-CCP-426-7.pdf.

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